

IN THE CLAIMS

1. (currently amended) A focus control apparatus which controls a focus of an objective lens for focusing light against an optical disk having a plurality of signal recorded layers, comprising:

focus drive means for moving the objective lens in a direction orthogonal to the recorded layers of the optical disk;

photodetection means for detecting reflected light from said optical disk;

focus-error-signal generation means for generating a focus error signal which corresponds to defocusing of said objective lens relative to any of said recorded layers of said optical disk, on the basis of a detection signal of said photodetection means;

recorded-layer movement control means for generating a signal which controls said focus drive means, on the basis of the error signal, in order to move said objective lens ~~on~~ for changing the recorded layer which is an objective of the focus of said objective lens; and

focus pull-in means for pulling in the focus of said objective lens onto said recorded layer on which said objective lens is to be focused, said pull-in means being permitted to switch on and off by said recorded-layer movement control means;

wherein said recorded-layer movement control means calculates an intermediate value of said focus error signal from a maximum value and a minimum value of said focus error signal corresponding to said recorded layer; and

~~in case of moving the focused position of said objective lens in response to a layer jump to one of said recorded layers, said focus pull in means for performing an automatic adjustment~~

~~of focus bias is turned on at a pull-in point when said focus error signal has corresponded to the intermediate value~~

in an automatic adjustment of a focus bias for each recording layer, said apparatus carries out processing of:

- a) measuring a focus error signal of the optical disk;
- b) calculating an intermediate value from a maximum value and a minimum value of the focus error signal in the recording layer which is a destination layer of the movement;
- c) pulling in the focus of said objective lens onto the recorded layer which is an origin layer of the movement to carry out automatic adjustment of a focus bias;
- d) moving the focus of said objective lens onto the destination layer and turning on the focus pull-in means when the focus error signal reaches to the intermediate value; and
- e) carrying out the automatic adjustment of the focus bias of the destination recording layer.

2. (currently amended) An optical disk playback system comprising a focus control apparatus which controls a focus of an objective lens for focusing light against an optical disk having a plurality of signal recorded layers, said focus control apparatus including:

focus drive means for moving the objective lens in a direction orthogonal to the recorded layers of the optical disk;

photodetection means for detecting reflected light from said optical disk;

focus-error-signal generation means for generating a focus error signal which corresponds to defocusing of said objective lens relative to any of said recorded layers of said optical disk, on the basis of a detection signal of said photodetection means;

recorded-layer movement control means for generating a signal which controls said focus drive means, on the basis of the error signal, in order to move said objective lens ~~on~~ for changing the recorded layer which is an objective of the focus of said objective lens; and

focus pull-in means for pulling in the focus of said objective lens onto said recorded layer on which said objective lens is to be focused, said pull-in means being permitted to switch on or off by said recorded-layer movement control means;

~~wherein said recorded layer movement control means calculates an intermediate value of said focus error signal from a maximum value and a minimum value of said focus error signal corresponding to said recorded layer;~~

~~in case of moving the focused position of said objective lens in response to a layer jump to one of said recorded layers, said focus pull in means for performing an automatic adjustment of focus bias is turned on at a pull in point when said focus error signal has corresponded to the intermediate value, in advance of playback of the optical disk; and~~

~~recording layer movement control is performed by using a focus bias value obtained by the automatic adjustment of the focus bias when the optical disk is reproduced~~

wherein in an automatic adjustment of focus bias for each recording layer in advance of playback of the optical disk, the apparatus carries out the following processing, and when the optical disk is played back, the apparatus moves the objective lens for changing the recording layer being the objective of the focus of the objective lens by using the automatically adjusted focus bias:

- a) measuring a focus error signal of the optical disk;
- b) calculating an intermediate value from a maximum value and a minimum value of the focus error signal in the recording layer which is a destination layer of the movement;

c) pulling in the focus of said objective lens onto the recorded layer which is an origin layer of the movement to carry out automatic adjustment of a focus bias;

d) moving the focus of said objective lens onto the destination layer of the movement and turning on focus pull-in means when the focus error signal reaches to the intermediate value; and

e) carrying out the automatic adjustment of the focus bias of the destination recording layer.

3. - 4. (canceled)

5. (currently amended) A method of controlling a layer jump of an objective lens for an optical disk having a plurality of signal recorded layers, comprising the ~~following steps~~ step of:

~~obtaining an intermediate value of a focus error signal from a maximum value and a minimum value of the focus error signal which corresponds to defocusing of the objective lens, and which is generated by a certain one of the recorded layers; and~~

~~turning on a focus servo at a pull-in point which pulls in a focus of said objective lens, with a bias at which the focus error signal corresponds to the intermediate value, in case of the layer jump to one of the plurality of signal recorded layers in order to perform an automatic adjustment of a focus bias of the objective lens for the recorded layer~~

automatically adjusting a focus bias for each recording layer in advance of playback of the optical disk, said adjusting including the steps of

measuring a focus error signal of the optical disk;

calculating an intermediate value from a maximum value and a minimum value of the focus error signal in the recording layer which is a destination layer of a layer jump;
pulling in the focus of said objective lens onto the recorded layer which is an origin layer of the layer jump to carry out automatic adjustment of a focus bias;
moving the focus of said objective lens onto the destination layer of the layer jump and turning on focus pull-in means when the focus error signal reaches to the intermediate value; and
carrying out the automatic adjustment of the focus bias of the destination recording layer, and
when the optical disk is played back, moving the focus of the objective lens onto the recording layer which is the destination layer of the layer jump by using the automatically adjusted focus bias.

6. (currently amended) A program product storing a program that is executable by an apparatus which plays back an optical disk having a plurality of signal recorded layers, in an automatic adjustment of a focus bias for each recording layer in advance of playback of the optical disk, said program being executed by causing said playback apparatus to execute the steps of:

~~obtain an intermediate value of a focus error signal from a maximum value and a minimum value of focus error signal which corresponds to defocusing of the objective lens, and which is generated by a certain one of the recorded layers;~~

~~turn on a focus servo at a pull-in point which pulls in a focus of said objective lens, with a bias at which the focus error signal corresponds to the intermediate value, in case of the layer~~

~~jump to one of the plurality of signal recorded layers in order to perform an automatic adjustment of a focus bias of the objective lens for the recorded layer, and~~

~~performing the recorded layer movement control by using a value obtained in the automatic adjustment of the focus bias when the optical disk is reproduced~~

measuring a focus error signal of the optical disk;

calculating an intermediate value from a maximum value and a minimum value of the focus error signal in a recording layer which is a destination layer of a layer jump;

pulling in the focus of an objective lens onto the recorded layer which is an origin layer of the layer jump to carry out the automatic adjustment of a focus bias;

moving the focus of said objective lens onto the destination recording layer of the layer jump and turning on focus pull-in means when the focus error signal reaches to the intermediate value;

carrying out the automatic adjustment of the focus bias of the destination recording layer,
and

when the optical disk is played back, said program causing the playback apparatus to carry out the step of moving the objective lens onto the recording layer which is the destination layer of the layer jump by using the automatically adjusted focus bias.

7. (canceled)